

PATENT SPECIFICATION (11)

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(54) TEST APPARATUS

- (71) We, SIMMS GROUP RE-
 SEARCH & DEVELOPMENT LIMITED,
 a British Company, of Concord Road,
 Western Way, Acton, London, W.3, do
 hereby declare the invention for which we
 pray that a patent may be granted to us,
 and the method by which it is to be per-
 formed, to be particularly described in and
 by the following statement:—
 This invention relates to test apparatus for
 use when testing the governor of a fuel
injection pump, the latter having a fuel
 control rod which is moved by the governor
 as the speed at which the pump is driven
 is varied.
 With a pump having a governor it is
 essential to test that the hysteresis of the
 governor over a particular speed range lies
 within prescribed limits and it is desirable
 that the test should be completed quickly.
 The hysteresis of the governor at a particular
 speed is represented by the difference be-
 tween the position of the control rod at that
 speed when the speed is rising and the
position of the control rod at that speed when
the speed is falling.
 The object of the invention is to provide
 such an apparatus in a simple and con-
 venient form.
 According to the invention apparatus for
 the purpose specified comprises means for
 providing a first voltage the magnitude of
which varies with the speed at which the
pump is driven, means for providing a
second voltage indicative of the position of
the control rod and a recorder to which said
voltages are applied and which produces a
display of the relative variation of said
voltages as the speed at which the pump is
driven is varied.
 According to a further feature of the
 invention said first mentioned means provides
 signals at an upper and lower speed for
 control of the pump driving apparatus to
 effect a lowering or raising of the speed.
 One example of an apparatus in accord-
 ance with the invention will now be described

with reference to the accompanying drawing.

As shown in the drawing there is provided
 a constant speed electric motor 10 which
 through the intermediary of an adjustable
 coupling 11, drives the fuel pump 12. The
 fuel pump is provided with a control rod 13
 the axial position of which varies in accord-
 ance with the speed at which the pump is
 driven.

Also provided is a toothed rotor 14 and
 this is mounted upon the shaft which inter-
 connects the coupling and the fuel pump
 or it may be mounted upon some other shaft
 which rotates at the same speed as the shaft
 or at some ratio of this speed.

Positioned adjacent the toothed rotor is a
 pick-up 15 which produces a series of pulses
 the frequency of which varies with the speed
 at which the rotor 14 is rotated. The output
 from the pick-up 15 is applied to a convertor
 16 which produces a d.c. signal the magnitude
 of which varies in accordance with the
 speed at which the pump is driven. The d.c.
 signal is applied to an X-Y recorder indicated
 at 17. In the arrangement shown the d.c.
 voltage from the convertor 16 is applied to
 the X axis of the recorder after suitable
 amplification.

Connected to the control rod 13 is a
 linear transducer 18 which produces a d.c.
 output voltage the magnitude of which
 depends upon the axial position of the
 control rod 13. This voltage is applied to the
 Y axis of the recorder 17 again after suitable
 amplification.

In use, a test consists of the pump speed
 being increased from an initial low value to
 a high value followed immediately by a
 reversal so that the pump speed decreases
 to its low value again.

During these speed changes a hysteresis
 loop is drawn on a sheet of paper by the XY
 recorder. The vertical height of the traced
 loop at a particular value of X, representing
 the amount of hysteresis of the governor
 under test at the particular speed of the
 measurement.

[Price 33p]

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It is arranged that the convertor 16 produces signals at an upper and a lower speed, the difference between these two speeds being the speed range over which it is desired to check the governor. The two signals obtained from the convertor 16 are applied to the control mechanism of the coupling 11 so that when the speed at which the pump is driven attains the higher value, the coupling automatically adjusts itself to reduce the speed and vice versa if this should be necessary.

WHAT WE CLAIM IS:—

1. A test apparatus for use when testing the governor of a fuel injection pump the pump including a fuel control rod movable by the governor, the apparatus comprising means for providing a voltage the magnitude of which varies with the speed at which the pump is driven, means for providing a second voltage indicative of the position of the control rod and a recorder to which said voltages are applied and which produces a display of the relative variation of said voltages as the speed at which the pump is driven is varied.

2. An apparatus as claimed in claim 1 in which said first mentioned means provides signals at an upper and lower speed for control of the pump driving apparatus to effect a lowering or raising of the speed.

3. An apparatus as claimed in claim 1 or claim 2 in which said voltages are d.c.

voltages.

4. An apparatus as claimed in any one of the preceding claims in which said means for providing said second voltage comprises a linear transducer operable by the fuel control rod.

5. An apparatus as claimed in any one of the preceding claims in which the means for providing the first voltage comprises a toothed rotor mounted on a drive shaft of the pump.

6. An apparatus as claimed in claim 5 including a convertor in which a.c. signals derived from the rotor are converted to a d.c. voltage to provide said first voltage.

7. An apparatus as claimed in claim 6 including an adjustable coupling through which the pump is driven.

8. An apparatus as claimed in claim 7 in which said convertor supplies said signals to effect raising and lowering of the speed at which the pump is driven.

9. A test apparatus for use when testing the governor of a fuel injection pump substantially as described with reference to the accompanying drawing.

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